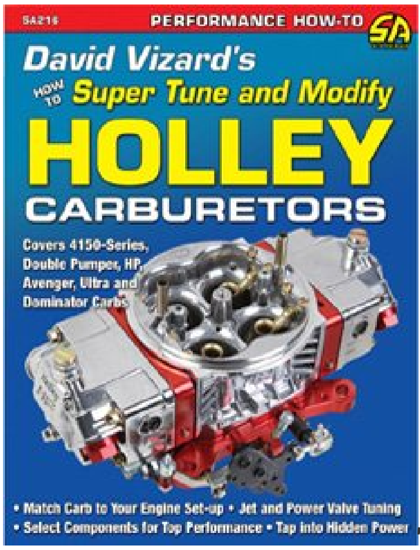
JULY 28, 2015 | Muscle Car Diy

Holley Carburetor: Fuel and Fuel Supply Systems Guide

I realize that the fuel typically flows from the fuel tank to the carb. But I am going to handle the fuel system from the main jet back. I am starting with fuel slosh and attempts to control it. It is largely a case of out of sight, out of mind. In practice, it's a gravity-induced fuel level. A point I really need to drive home here concerns the bowl's fuel level stability and its ability to combat fuel foaming. The problem in appreciating resistance to foaming and fuel level is that for the most part they are only ever seen (and rarely, at that) while the engine is on a dyno. That is an artificial environment and suffers zero effect from g forces. It is largely out of sight, out of mind. In practice g-induced fuellevel changes and foaming of the fuel occur to a far greater extent than most racers suppose.



This Tech Tip is From the Full Book, [DAVID VIZARD'S HOW TO SUPER TUNE AND MODIFY HOLLEY CARBURETORS](). For a comprehensive guide on this entire subject you can visit this link:

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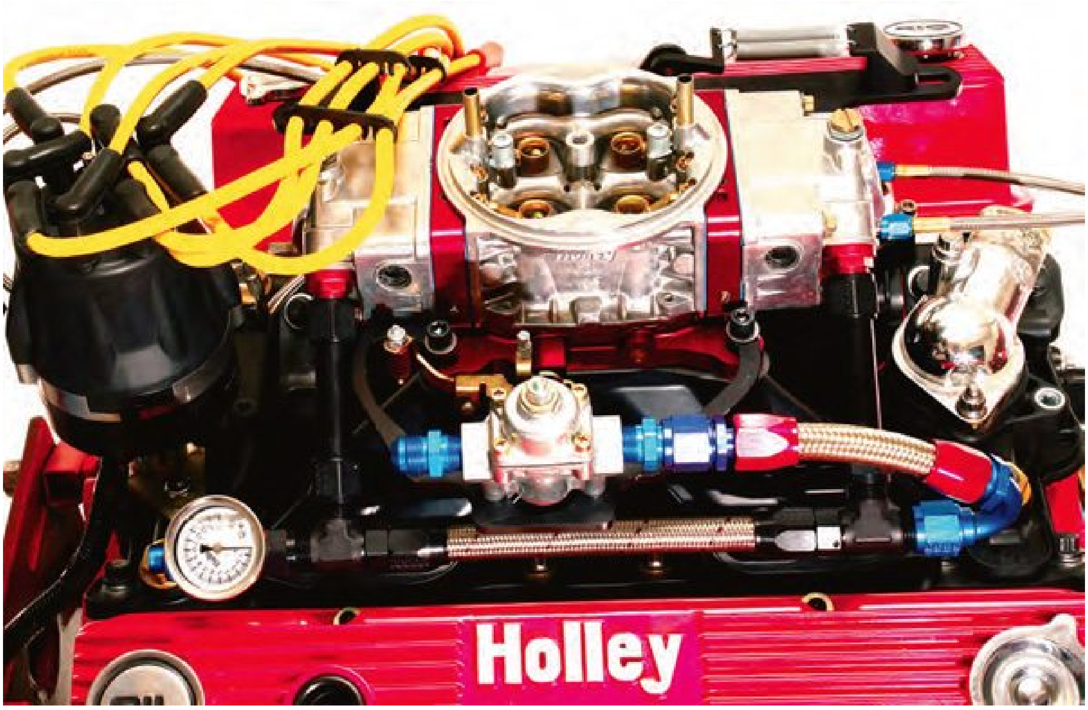
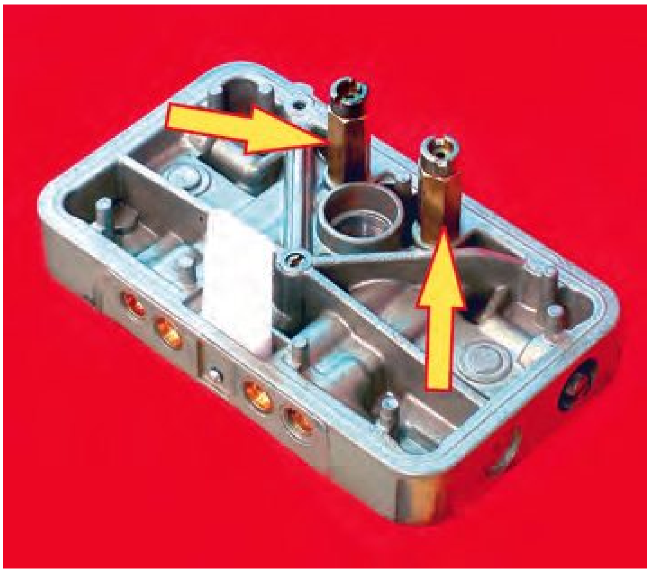


To make the metering and atomization functions of a carb work as intended fuel pressure, flow, slosh, and foaming management are all critical. The design of the fuel system from the tank to the carb's jets dictates successful operation.



Shown here are the main jet extensions used to compensate for fuelbowl surge during high-g operation.

Clearance between the jets (lower photo) and the fl oat (upper photo) of a side-hung fl oat bowl is about 0.300. Jet extensions in this shorter bowl need only be half the length of those in a center-hung bowl, so a 0.250 jet extension produces the necessary results. To install jet extensions, use a nitrophyl fl oat and cut away about 1/4 inch deep section of the fl oat (shaded area in top photo) and reseal the fl oat with epoxy

This center-hung fl oat has cutouts on the lower surface used to clear the jet extensions.

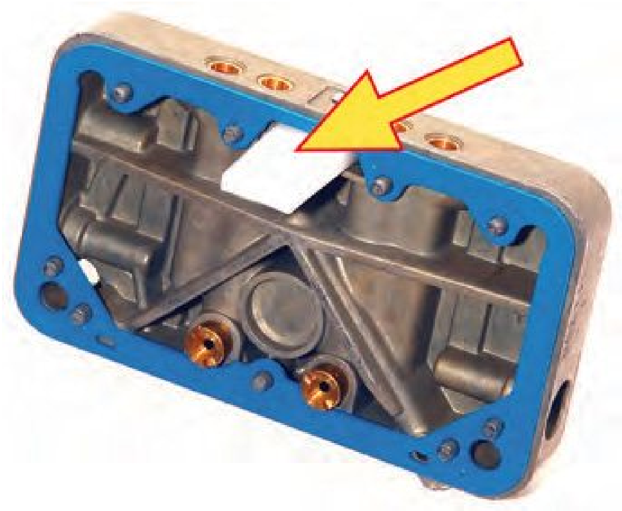
Let me give you an example. Just after oxygen sensors became a fixture in the automotive world, I did some mixture tests measuring all eight cylinders while on a dyno then at the track. On the dyno, the engine ran with a consistent 12.9 to 13.2:1 air/fuel ratio throughout the RPM range. However, the g forces at launch down the strip caused most of the front cylinders to run as rich as 9:1 while some of the back cylinders leaned out off the scale at an inferred 18:1. My question here is: Does that sound like acceptable fuel control? No, it certainly does not. Your fi rst job is to set the fuel level as discussed below in "Fuel Level Adjustment."

Jet Extensions, Fuel Slosh and Fuel Level

Under hard acceleration, the fuel piles up at the back of the fuel bowls. On the drag strip, the fuel surface can be 45 degrees or more than what it is at static when the car is stationary. Video of a Plexiglas-windowed fuel bowl shows, on a pass down the drag strip, fuel foaming far beyond what you may have expected. Indeed there is some fuel foaming on the dyno when the engine reaches a certain RPM and strikes a vibration frequency that coincides with a frequency multiple of the fuel in the bowl.

The fi rst move in fi xing back-cylinder launch lean out is to equip the rear fl oat bowl's main jets with jet extensions. If you are road or circle track racing, go ahead and fi t jet extensions all around. These jet extensions can be of varying length. For drag racing, they can be long, but for road or circle track a mid-length setup is better. It puts the fuel pickup about in the middle of the fuel bowl, so it is able to handle braking as well as acceleration fuel surge.

These AED jet extensions have oval-shaped ends, which can be used without cutouts in the float.



This is an anti-spill device for the fuel bowl, popularly known as a "vent whistle."

Sometimes a float that bounces around too much, such as in off-road use, can be tamed somewhat by using a stronger bumper spring. Braswell Carburetion makes a 0.016 and a 0.017 spring for replacement of the stock 0.015 springs.

A center-hung fuel bowl is installed on most high-performance 4150- and 4500-style carbs. If you are drag racing, you almost certainly need to use jet extensions and the appropriate cutaway float.

When fuel stacks up on the outside of the bowl during cornering on a circle track, it causes the needle valve to shut off the fuel supply earlier. To combat this, Holley offers this wedged float.

When using jet extensions, you need a fl oat with cutouts that clears the jet extensions. But there are some exceptions, such as AED jet extensions, because they are oval at the open end and they clear most floats.

Another problem you are likely to see in high-g circumstances is that the float can bounce around and lose much of its control over the fuel level. This is especially true with off-road use. For better fuel control the bowl should be equipped with a whistle vent (Holley PN 26-89). Holley's high-performance carbs, such as those in the HP line, come with a whistle vent in the bowl. (An alternate to the vent whistle is a vent screen [Holley PN 26-39] but the vent whistle is the preferred choice in most cases.) Also, to better control the float motion during high-g vertical motion, a stronger bumper spring is often a help. Braswell, for example, has two springs stronger than stock.

If fuel slosh/surge proves to be a problem, part of the reason for the engine stalling could be that the fuel has sloshed out the vent tube and gone into the engine. When this fuel enters the engine, it makes it very rich. For some vehicles it's a persistent problem and for a hard-charging off-road vehicle it is always a problem. To prevent this, attach a hose to the vent tubes to extend them while still keeping the open end within the confines of the air filter.

Floats and Bowls

A number of modifications can be made to floats to better deal with g-induced fuel slosh and foaming. A variety of floats are available, but for the performance 4150–4160 and 4500 carbs, some are designed to work better than others. Before you modify any float, check out the offerings from Holley or Braswell Carburetion; there is a good chance you can buy what you need rather than making it. Most Holley carbs for highperformance single-carb applications utilize a center-hung float and float bowl. Typically, these carbs are mounted with the fuel bowl aligned with the axis of the vehicle. During high-speed cornering, the fuel migrates toward the outside of the turn. This can cause the float to shut off the needle a little earlier than normal. This reduces the amount of fuel entering the float bowl and thus reduces the fuel height and availability for at least one of the jets in each bowl.

In road racing, autocrossing, or other forms of competition with left and right turns, a double-wedged float can be used, such as this one from Braswell.

For a circle track car Holley offers wedged nitrophyl floats, one designed for the front float bowl and one for the rear. If the application is for a road racer, the floats may need to be wedged on both sides. A Holley float can be used as a pattern, or you can check out Braswell's range of floats.

Holley's carbs can have white plastic, brass, or nitrophyl floats. The most popular for high-performance applications is the nitrophyl version. In terms of flotation, they are no better or worse than either of the other types, but they are alcohol compatible and their shape can be altered to suit certain parameters. When modifying a nitrophyl floats to the shape required, you cut through the non-porous outer skin of the float into the foam inner structure. Once the float has been reshaped, a thin smear of epoxy can be used to reseal it. Note that having a float that does not leak is vital. Whether modified or not, you should check that the float does not leak or has not developed any porosity. For a nitrophyl float porosity can be determined by weighing the float on a gram scale then immersing it in fuel for a couple of hours and then reweighing. The tolerance for leakage/porosity is zero!

Needles and Seats

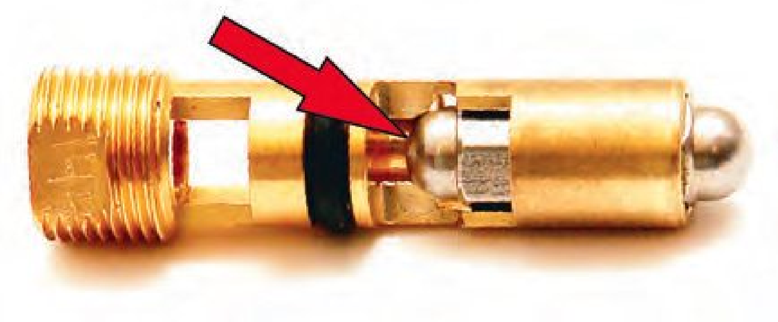
Fuel bowl needles and seats can be an area in which issues that lead to fuel foaming and loss of fuel level control start. On top of that, you need to select a needle and seat assembly that flows sufficient fuel to meet the engine's demand. The fuel flow per float bowl needs to be in the region of 0.5 lb/hour/ hp for gasoline, about 0.8 for ethanol or E85, and 1.3 for alcohol. It's not difficult to hook up a pump and regulator to a fuel bowl with the float dropped just shy of its full travel and weigh what passes through it in one minute. Water can be used; it weighs about 25 percent more than fuel. But for most practical purposes, you don't need to take these measures.

Typically for smaller carbs, say up to about 650 cfm, Holley's 0.97 needle and seat generally does the job. For anything up to 750 cfm, a 0.110 assembly should be just fine. Beyond that, a larger assembly might be needed. Holley and several other manufacturers make them up to 0.150-inch needle. Most needles for gasoline applications are Viton tipped and conical in shape. For alcohol applications the needle needs to be made of a material that's compatible with alcohol as many types of plastic/ Viton mixes degrade with alcohol. Your best bet is a steel needle, which is unaffected by alcohol. However, don't use a non-Viton-tipped needle just for the sake of it. A Viton needle does seal better at low fuel demands.

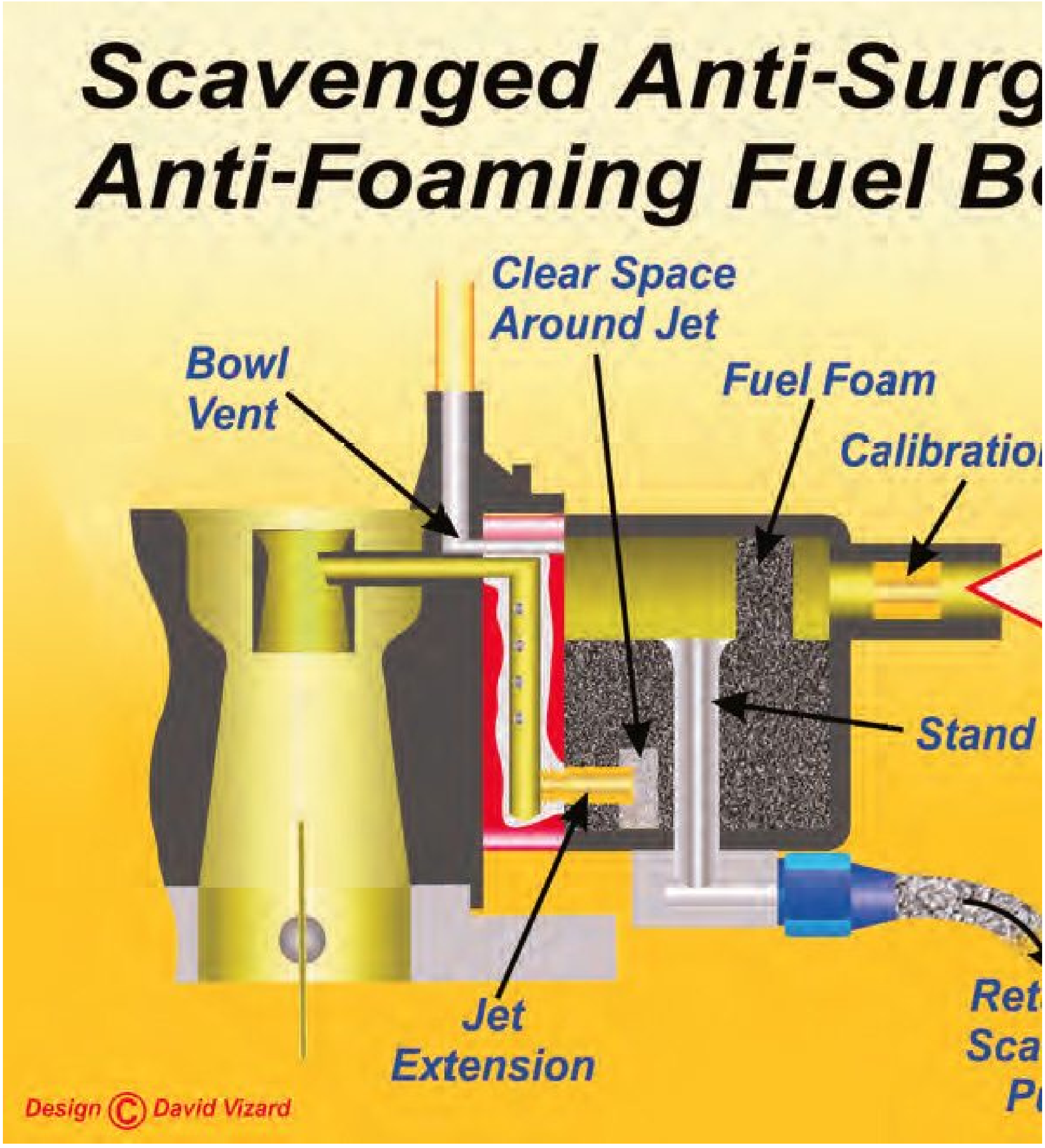
The shape of the needle is also a factor in fuel flow. A conical-point needle is convenient to make, but a correctly designed spherical form provides for more sensitive fuel level control at idle and low speed. In addition, this type of needle has the capability of significantly more flow for WOT usage. Other than Braswell, BLP makes a spherical-ended, high-flow alcohol needle. Any of these spherical needles flow enough alcohol for a substantial four-figure power output.

Most needle and seat assemblies are either of “picture window” design or what is popularly known as, but misnamed, a “bottom feeder.” What this actually means is that the needle/seat assembly has a bottom discharge capability by virtue of a sculpted needle so that fuel can discharge via the windows and the bottom of the brass body.

This is a typical Holley Viton needle valve. The same material and conical shape is used on virtually all gasoline needles.



This is the needle shape I came up with in the 1970s while working with Holley guru David Braswell. It has become the most popular as it overcomes significant flow limitations of a conical needle.



This schematic is helpful for fixing fuel slosh and foaming. Fuel control in the bowl is so steady that the carb runs over any terrain at any speed in much the same manner as fuel injection. Let's discuss the components, starting at the fuel input. Fuel to the calibration jet must be fed from a fuel pump capable of at least 10 psi at the jet. Output from the pump must be via a pressure regulator situated near the fuel bowl as this is a calibration factor. Fuel pressure is initially set on the pressure regulator (I used 9 psi). The fuel is fed to a jet that allows just enough fuel to flow to meet the engine's needs at maximum demand. This flow value can be calculated from the fuel flow figures seen on a dyno or can be estimated by assuming 0.45 pounds of fuel per horsepower per hour are used. In practice the fuel pressure is backed off until the oxygen sensors indicate the mixture is just starting to go lean and then increased by about 1/4 psi. The type of pressure regulator to use is one that references intake manifold pressure so at idle the fuel pressure is only about 3 to 4 psi. The fuel coming from the jet should first enter an open volume and then flow onto fuel foam to dissipate its energy. The standpipe height can be adjusted. It works just fine if the top of it is set at the stock Holley fuel height but it's worth knowing that fuel control is so good that the stock fuel level to jet spill height is way more than needed. The fuel level can be raised without penalty if it proves to be beneficial to have the main system pull in sooner. The scavenge pump must be able to pull out all the excess fuel when the engine is at less than WOT so its capacity needs to be about as big as the inlet pump. Jet extensions should reach to about the middle of the fuel bowl. The area around them needs to be clear of foam so as not to impede flow to the jets themselves.

This is Moroso's bowl extension and fuel tank foam fuel control conversion kit. A number of successful off-road racers use this system and report positive results.

For a conventional needle and seat to work at its best use as little fuel pressure as possible along with the biggest needle possible so that the fuel has less tendency to enter as a high-speed jet, which may lead to foaming. A bottom-feeding needle and seat assembly is a little better than a regular window assembly, but it is still far from optimal when high-gs and vibration are involved. (But things could change here; see "Fuel Level Adjustment" on page 110.) At the time of writing, Bo Laws Performance is developing a true "bottomfeeding" needle and seat assembly that actually feeds the bottom of the float chamber. The fact that this needle and seat assembly feeds within 1/8 inch of the bottom of the fuel bowl makes a huge difference in the ability of the system as a whole to avoid fuel foaming.

Many off-road racers use the Moroso fuel foam/bowl extension kit in Figure 12.14. I have no personal experience with this anti-slosh kit, but it looks as if it should work, and that's an opinion supported by a couple of off-road racers, who have reported their successful results back to me. If your application needs a fix for fuel surge, there is one. I got the idea from the late Sig Erson of Erson Cams while he was visiting me in England in 1974. The weekend he was with me he volunteered his services as a crew member for my British Touring Car Championship race at Thruxton. We had suffered minor fuel surge problems with our Weber carbs and Sig claimed the following solution to be a 100-percent fix. As our off-road Holleys later proved it was a 100-percent fix, and Figure 12.13 shows how it was done. As you can see the system uses fuel foam, a standpipe that acts as a weir setting the fuel level, and a scavenge pump.

Although it may seem as if the standpipe is plumbed in and everything is done, we could still do a measure of tuning. In practice, for a carb equipped with a regular float bowl, there is a calibration element in the fact that as the fuel demand increases, the fuel level drops. This means that there is a leaning-out process countered by the jetting. When making a change to the standpipe/ scavenge system, the fuel level stays essentially unchanged so the top end can be richer than with the float assembly metering to the fuel bowl. The way around this is to start with a restrictor jet that is just a little bigger at, say, 7 to 8 psi pump pressure, and then turn down the pressure in small increments until a lean out simulates the float assembly. At this point your jetting is back where it was with a float setup.

Pressure Regulators

Running just the right fuel pressure is important. Indeed, minor adjustments to find optimal pressure can be a tuning aid. You are looking for sufficient fuel pressure to supply a little more fuel than the engine needs at the lowest pressure possible because this minimizes fuel foaming (aeration). While this seemingly delicate situation may not be of much consequence to the street performance, bracket, or amateur racer, a 3- or 4-hp increase for a pro could make the difference between winning and losing.

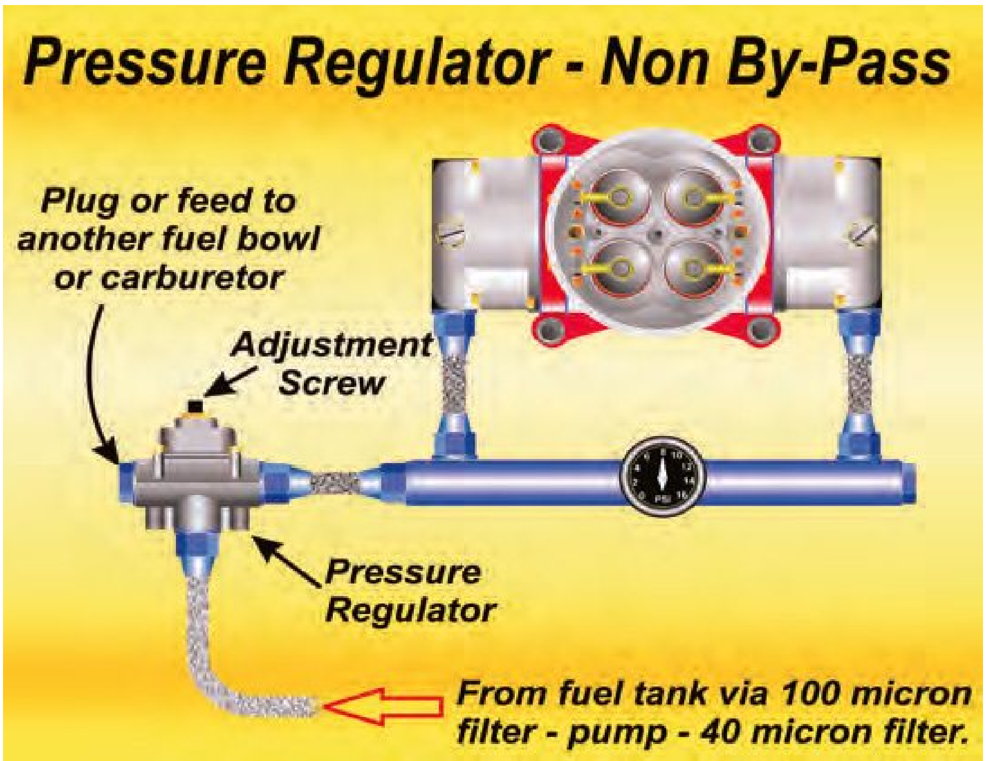
So this little revelation now begs the question, “What pressure should I use for my application?” Let’s start with what you may need to build a good but inexpensive setup for your street machine. It’s common for a fuel pump with no more than 8-psi output pressure to be used without a pressure regulator. Holley states that a pump of 9 or more psi (as per their highperformance pumps) should be used with a pressure regulator.

For the price of a simple, low-cost pressure regulator it is worth installing anytime fuel pump pressure is more than 6 psi. For an entry-level installation you need little more than a basic two-port inline regulator. This is as simple as it gets. You just install the regulator in the line and adjust the pressure to about 6 psi.

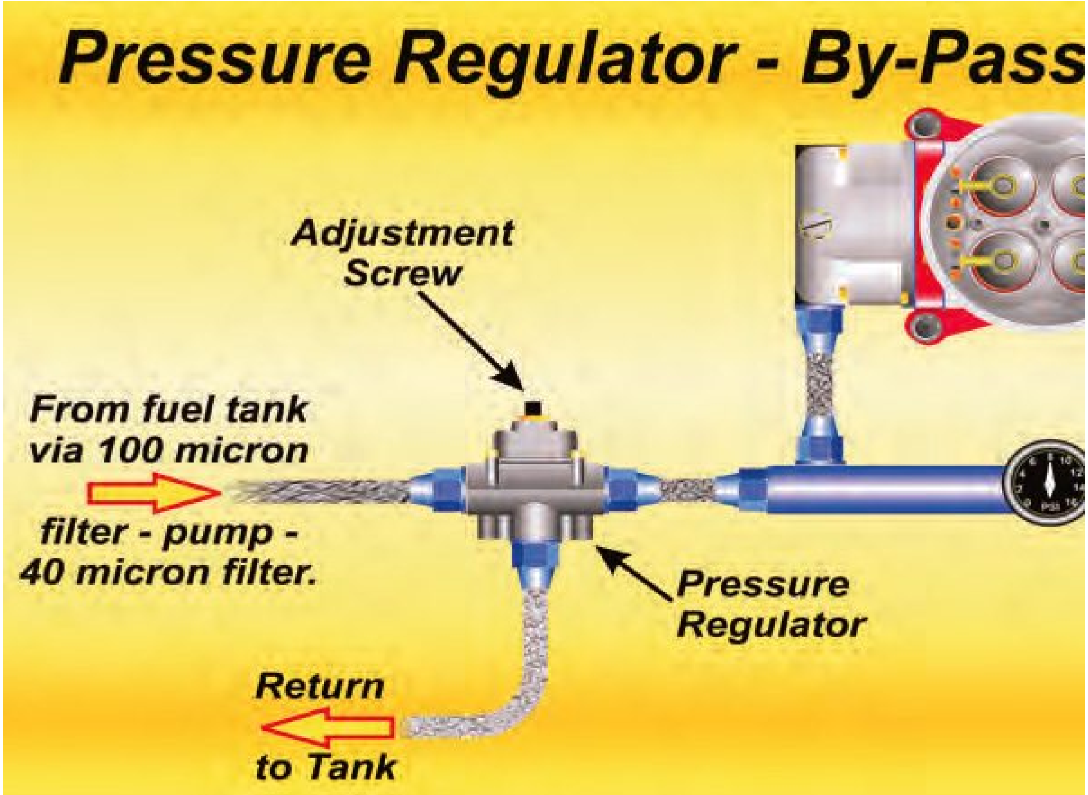
A high-output fuel pump, typically pumps at pressures up to 14 psi with some going as high as 25 psi. These pressures overwhelm the needle and seat assembly in the fuel bowl. Here a typical inline regulator (such as Holley’s 12-803 unit) works. However, you can install a bypass regulator to improve control and increase pump life. If there is a return line from the front of the vehicle to the tank or you are prepared to install one, it is a better choice to go with a bypass regulator (such as Holley’s 12-803BP). With this system, pressure is held at the set value by allowing the fuel to bleed off back to the tank. This means the pump is not “dead headed,” which means it is not trying to pump fuel pressure against a closed or nearly closed output that is virtually stalling it.

Under these conditions, the pump runs hotter and the fuel heats up. Neither is what you want. The bypass regulator circulates excess fuel from the tank to the regulator and back to the tank. Plumbing for both types of regulators is shown in Figures 12.16, 12.17, and 12.18. If you are building a super-cooled fuel system as described in Chapter 11, you can use an inline pressure regulator and the system will, to an extent, act as a bypass regulator (as fuel is continually drawn from the fuel bowl by the system's scavenge pump). Therefore, the main fuelsupply pump is never dead headed.

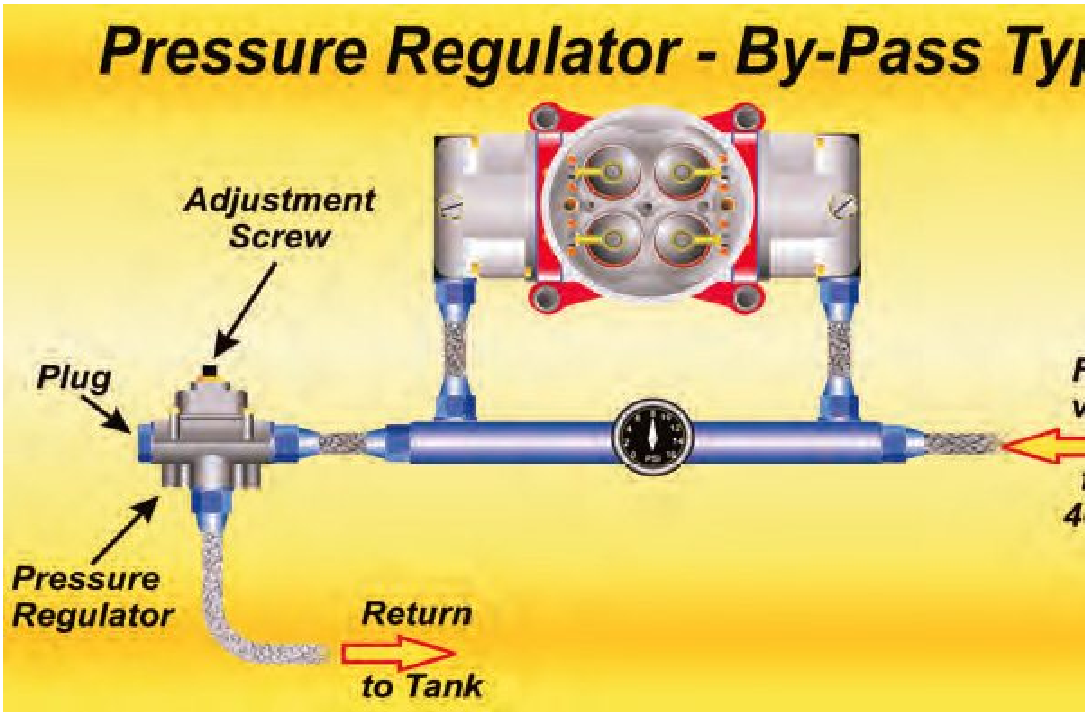
This is Holley's non-bypass regulator (PN 12-803). It is a real workhorse at an affordable price. If you want to build a better but still basic fuel system this is the unit to install



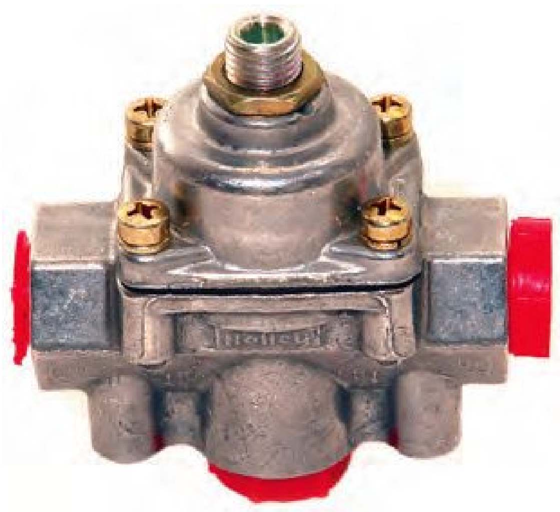
Here is how you plumb in Holley's (or any other similar type) non-bypass pressure regulator (PN 12-803).



If you are using a bypass regulator the pressure is controlled not by dead-heading the fuel to limit the pressure but by bypassing excess fuel back to the tank. This requires a return line and the plumbing routing seen here.



This is an alternate method for plumbing in a bypass pressure regulator.



This is Holley’s bypass pressure regulator (PN 12-803BP). A unit like this is about twice the cost of a nonbypass unit (PN 12-803) and requires a return line. However, the extra cost does buy you better fuel pressure stability.

Holley sells these billet pressure regulators: model 12-840 (left) and the bigger, higher-capacity 12-843 unit (right). Both have a refined, precision, non-bypass design intended to maximize fuel pressure stability when a non-return system is used. Holley also has equivalent billet-style units in bypass configurations.

Although Holley’s billet regulators cost a little more they do provide the ideal place to locate the virtually mandatory pressure gauge.

Setting the idle fuel pressure is just one aspect of optimizing the prevailing fuel pressure. Equally important is to know how the fuel pressure may vary as the vehicle travels down the track. To see this you need a dash-mounted fuel pressure gauge. Do not use a mechanical one as this can be dangerous in the event of a crash. Shown here is the Holley electric unit. It isolates fuel from the driver’s compartment.

This Holley pressure regulator mount locates on the carb. This is not only convenient but also makes for a smartlooking installation.

This four-outlet port regulator is set up for a pair of 4-barrel carbs. The fitting allows braided lines to be used to each fuel bowl. The regulator itself needs to be mounted centrally fore and aft of the carbs and laterally at a point that minimizes fuel line length yet also avoids exhaust system heat.

This Mallory pressure regulator can be boost or manifold-vacuum pressure referenced. This allows a reduction in fuel pressure to be made at idle. This is especially useful for alcohol-fed engines where the pressure at maximum output may need to be as high as 9 psi. If more pressure than this is required, investigate the needle/ seat flow as it may be questionable.

Aeromotive makes a nice range of manifold referenced fuel pressure regulators. My experience with this company's products has only been positive.

If you are going to use E85 or alcohol as a fuel, you need a fuelcompatible pressure regulator. Holley's selection is a good place to start, but if you want to expand your range, check out Summit's large selection. When alcohol is used, you need a large needle valve and adequate fuel pressure to flow enough fuel for maximum power. Fuel pressures need to be adequate at WOT and maximum RPM, but these higher pressures are often too much for the float to accurately control the fuel flow at idle. If the pressures are set for idle, the engine starves of fuel at the top end. This situation is by no means universal, so it depends on the design of needle and seat used in the fuel bowl as well as its effective diameter. I have a friend who has just wrapped up a championship with his dragster and has not run a single pound over 3 psi all season. Therefore, if the needle and seat pressures are good enough, high pressures are not needed. However, it may take a while to sort through your fuel system to get to this happy state.

The best way to run strong while still in the process of making adjustments is to have a vacuum-referenced pressure regulator, such as one made by Mallory. A few other companies, such as Aeromotive, also make vacuum/boost-referenced, fuel-pressure regulators worthy of consideration. All these regulators compensate linearly, and that means for every 1 psi the intake pressure changes, the regulated fuel pressure changes the same amount. Here is how this works for an alcohol-fueled engine. If, at idle, there are 6 inches of vacuum (3 psi), the pressure regulator reduces the pressure delivered by 3 psi. So if the base pressure is set at, say, 6 psi, then, at idle, it is 3 psi.

Using one of these pressure regulators makes it much easier to sort out an alcohol carb, especially if it's a big-block with a Holley Dominator or two. Summit Racing's website includes the function and application of about three dozen brands.

Fuel Lines and Filters

The carburetor can be considered the end of the fuel system where the real business is conducted. The fuel supply must exceed the engine's demand. Therefore, you need to select an adequate pump and make sure the system losses, as fuel is pumped from the tank to the carb, are minimized. When building an effective lowloss fuel line, the first concern is to route the line as far from heat sources as possible. Should you think such a move is unnecessary, I suggest you read Chapter 11 on system thermal management again.

Once a viable route is established, you need to determine the ideal fuel-line diameter. Most factory fuel systems use 5/16-inch diameters. At about 6 psi, a stock pump does not deliver sufficient fuel volume for an engine that produces real power. Some fuel lines are complex to replace but if pump pressure is increased, the pipe's restriction is partially offset by the higher flow. Doubling the pump pressure results in an approximate 40-percent increase in flow at the carb.

If your carb has a sintered bronze filter, replace it with a higher-flow regular filter. The sintered units are only good to about 375 hp.

Holley has two versions of this type of canister fuel filter. One is 5/16 (PN 162-524), the other 3/8. The 3/8 (PN 162- 523) version is good to about 500 hp.

If you are building a fuel system using braided hose with aero-style fittings, Earl's sells cost-effective in-line filters. These have replaceable filter elements that makes checking and refurbishing easy

You need Holley's pro-quality billet-case fuel filters if you plan on building a top-of-the-line fuel supply system.

If you'd rather not replace the fuel line, you can explore the use of one of Holley's 14-psi electric pumps and a pressure regulator. You can test the flow of your setup by running the pressure regulator outlet into a graduated can. In round numbers 1 quart per minute is good for 180 hp. If your 14-psi electric Holley pump in conjunction with a regulator cutting the pressure to 7 psi meets your needs, you can go with a 5/16-inch line. If that's not enough, you need to increase the line to a minimum of 3/8 inch (-6 hose). This meets the needs of most street and street/strip vehicles that produce up to about 600 hp, although that figure is dependent on just how many sharp, right-angle fittings are used. If it is a race application, 1/2-inch diameter (-8 hose) should be considered a must.

The type of hose material is another factor that can come into play. Although a rubber hose spec'd for gasoline may provide adequate performance, it does present more resistance to flow than a purposemade braided fuel line, such as produced by Earl's Performance Products (a division of Holley). Also, as a safety issue, you should use steel or vinyl braided hose for higher pressures, such as those delivered when Holley's top-performance pumps are in use.

Fuel filtration can be a big obstacle in cutting flow losses. First, if your Holley carb has the sintered fuel filter housed at the fuel bowl's inlet fitting, you should replace it if your engine makes more than about 375 to 400 hp. Use a high-quality, in-line, freeflow, coarse fuel filter at the pump inlet. Use a fine fuel filter anywhere after the pump and prior to the pressure regulator.

Mechanical Fuel Pumps

The style of mechanical fuel pump you most often see on a production V-8 is used because it is quiet, cost effective, and reliable. It is also the style of pump mandated for use by a number of premier NASCAR series. To meet the demand, Holley developed high-performance versions. Having an engine-mounted pump up front means sucking fuel from a tank as far away as 10 feet. When the vehicle accelerates, the pump has a much harder time sucking fuel than a pump that pushes it from the rear forward. Also, an engine-mounted pump gathers much heat and consequently unnecessarily warms the fuel. OE-type mechanical pumps, for the most part, have a good flow rate so they can supply engines up to 500 hp.

My advice: Only use a mechanical pump if it is adequate for your engine or the race sanctioning body requires it. If a mechanical fuel pump is required, use a really stout one with a high gallons-perhour (gph) rating. The fuel is sucked forward from the tank to the carb, which is harder to do under high-g acceleration.

Stock mechanical pumps are generally good for 50 to 80 gallons per hour. By the time installation losses are taken into account, this equates to 375 to 600 hp. This Holley pump, for a small-block Chevy (PN 12-327-13), is good for 130 gallons per hour.

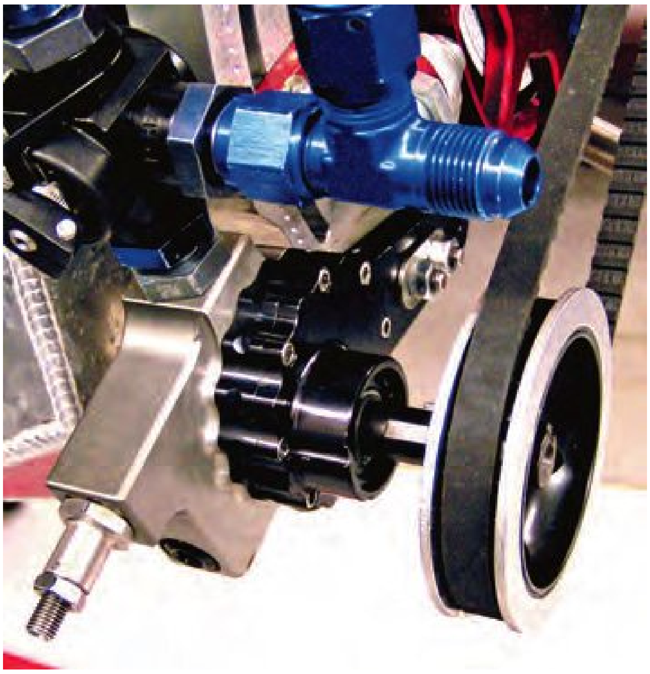
This is Holley's pump for a smallblock Chevy (PN 12-327-30). At 200 gallons per hour it can accommodate about anything you can throw at it, such as more than a 1,500-hp fuel demand.

An electric pump at the back pushes fuel forward and these pumps are typically very consistent. Here, some numbers might help you make your decision. For a 10-foot tank-to-pump line and a 1-g start line launch, the pressure starts at the input side of the pressure regulator, and drops by 3.3 psi when it reaches the regulator. Since most vehicles can launch at more than 2 g, you can see that a pump sucking from the tank is at a disadvantage. The most suction that can be applied is equal to the atmospheric pressure (14.7 psi at sea level). If the fuel tank is mounted in the engine compartment just ahead of the engine, a mechanical pump works just fine.

Where a conventional pump, such as a high-flow Holley Ultra unit, has advantages is in a circle track situation where an alcohol carb is used. The gs pulled off the corner are not as high as at the start of a drag strip pass so the loss of pressure at the pressure regulator is not the big issue. Using a conventional cam-lobedriven pump is a good way to get an effective high-flow fuel system. If you need a top-of-the-line performance pump, Holley is sure to have one for you. When installing a mechanical pump, be sure to check the type of pressure regulator needed for it.

Alcohol Applications

A whole class of belt-driven mechanical pumps are offered for high-performance use with alcohol applications. The belt is installed on the nose of the cam or remotely mounted (fuel tank, usually) and cable driven. These pumps are expensive, and many are intended primarily for alcohol fuel-injection systems. However, the increasing usage of alcohol carbs has brought about the production of many pumps specifically aimed at meeting the needs of an alcohol-carbureted engine. If you are intent on a high-tech fuel delivery system for your alcohol-fueled engine, you can get specific information from companies such as Bo Laws Performance, Enderle Fuel injection, Hilbourne Fuel Injection, Kinsler Fuel Injection, Ron's Fuel Injection systems, and Waterman Pumps.



A belt-driven fuel pump for an alcohol carb, such as this Bo Laws unit, is well thought of by many professional Holley carb specialists.

My experience in this area has been limited to a couple of drag race applications and a half dozen or so circle track applications. What I can tell you is that the Bo Laws alcohol pump is highly recommended by a number of top carburetor specialists. I have also used Ron's Fuel Injection alcohol pumps to good effect. And I know that Waterman has a very large number of choices.

Electric Pumps

In conjunction with Holley carbs, most performance applications are likely to use an electric pump.

Flow Capability

Before making your selection, it is wise to have some idea of how big a pump your engine is likely to need. Looking at the fuel flow ratings is your starting point. Holley's performance fuel pumps are primarily rated by their free-flow capability. This number can be misleading. You need to be aware that the greater the restriction, the lower the flow. For that reason, Holley gives a second number that provides the flow volume at a given pressure. You should have at least 7 psi for high-pressure pumps, and no more than 14 psi. And you should have at least 4 psi for lowpressure pumps, and no more than 7 psi. The figure you need to work with is the second, smaller figure. At the end of the day, just how suitable your pump is can be greatly affected by how free flowing the plumbing is from the pump to the carb.

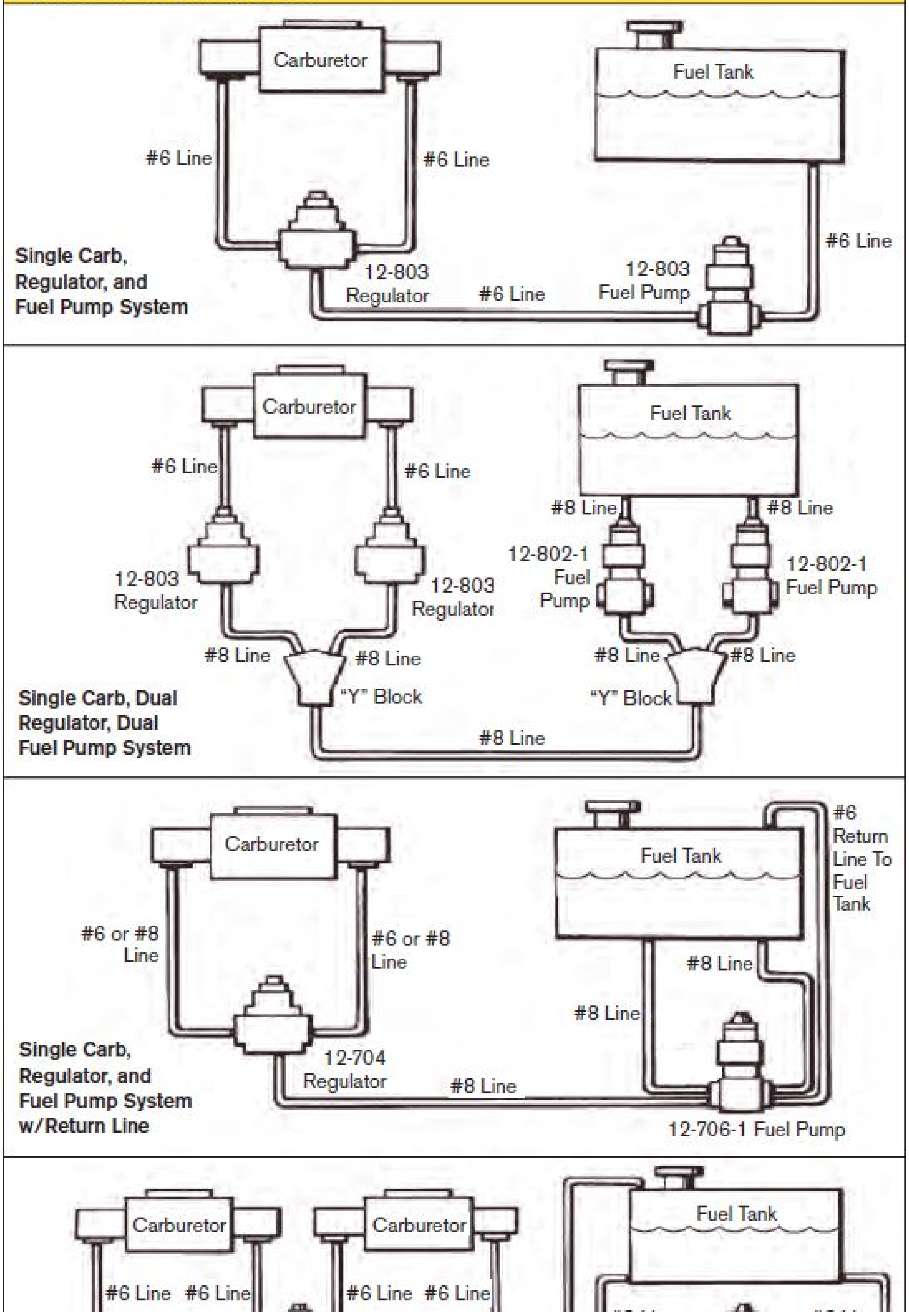
This is Holley's blue-top highoutput pump. It has been favored by enthusiasts for probably 30 years. About 90 percent of engines I build make use of this versatile and cost-effective pump.

This Holley pump (PN 12-150) looks good and is still all business when it comes to flow. This unit moves 140 gallons per hour at 7 psi.

This Holley inline high-performance pump is smaller than average, but it has low-current consumption. It's operationally quiet and pumps enough fuel for a 900-hp carbureted engine.

Building engines for magazine projects as I do means building good looking engines. Here are some of Holley's high-performance pumps, regulators, and filters that make my job just that much easier.

Fig. 12.38. Holley fuel pumps.



As an example, Holley's perennially popular "blue top" pump delivers 88 gph at 9 psi. If there is no loss in the system, this pump can support a 1,300-hp output of a well-tuned race engine. That looks good in theory, but what about in the real world? Such an output means that each gallon the pump moves per hour supports 15 hp. But that does not take into account fuel-system losses. The reality is that some systems are a plumbing nightmare: For each gallon per hour of its rated flow at the quoted pressure, a given pump may only support 8 to 9 hp for every GPH of rated flow. If you build a good fuel system, that figure can go to 10 hp per gallon of rated flow per hour. If you build a reasonable system, that Holly "blue top" meets the needs of a 750- hp engine. But if you build a really good fuel system, it supports 880 hp.

Holley's "red top" pump can be used without a regulator. Its output at the pump is 7 psi and even at idle this is a little less at the fuel-bowl needle valve. This sort of pressure is acceptable but I still use a regulator to reduce that to about 5 psi. With high-output pressure pumps (14 psi) a regulator is virtually mandatory.

Pressure Output

Next, you need to learn whether the pump should be used with a bypass regulator or a non-bypass regulator. An excess pressure limiting recirculatory bypass valve is installed within Holley's electric pumps. The pump's output-side pressure acts upon a spring-loaded pressure relief valve. When that pressure exceeds the set limit (14 psi for high-pressure pumps), the valve opens against the spring and feeds the fuel back to the inlet side of the pump. Although this is an effective way to control maximum pressure, it does mean the electric motor powering the pump can become hot and the action of recirculating fuel causes the fuel to heat up. The way to minimize this is to use a pump compatible with a bypass regulator rather than a dead-head regula tor as with a non-bypass unit.

When it comes to plumbing your fuel pump into the system there are a half dozen or so options depending on the number of carbs, the type of fuel used, etc. Holley has all the layouts you are likely to use as shown in Figure 12.38.

Written by David Vizard and Posted with Permission of CarTechBooks